PATIENT DATA COLLECTION SYSTEM

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PATIENT DATA COLLECTION SYSTEM

Field of the Invention

This invention relates to instruments for detecting and measuring biological functions and for collecting patient screening data.

Background of the Invention

It is common practice before a patient undergoes a medical exam or receives medical treatment to collect information about the patient's medical history and present physical condition, which information typically includes the patient's sex, age, height, weight, heart rate, blood pressure and any prior physical injuries, conditions and allergies to medications. In the course of such a patient screening process, many physicians also ascertain the quality of the patient's hearing, vision and balance, especially with older patients. Many employers also require similar screenings of employees as a condition for employment and often for continued employment.

Presently, patient height is measured manually with a measuring device or height gauge, weight with a scale, heart rate with a heart rate monitor or manually, and blood pressure with a sphygmomanometer. Hearing is usually measured with tone delivering instruments or by whispering words for the purpose of ascertaining whether the patient can hear and understand the whispered words or by means of a comprehensive hearing exam, and balance by means of a force platform, which is an instrument that receives an individual in a standing position and measures the forces exerted by the individual that relate to his or her standing sway. Other subjective tests can also be used for measuring the competence of a patient's balance. Vision quality is usually ascertained by means of a conventional vision exam, which entails the patient reading various lines of a standard Snellen eye chart or the like.

Physicians are typically very busy and their offices understaffed. Because it takes a considerable amount of staff time to ascertain patients' medical histories and states of physical condition, this patient screening is usually done carelessly, incompletely or not at all. Furthermore, few physicians have force platforms in their offices because they are expensive and do not generate

adequate reimbursement fees. As a result, most physicians who ascertain balance competency in patients in screening procedures do so with subjective and poorly accurate evaluations based on the subject's capability of walking, standing from a chair and other daily activities.

Given these and other deficiencies in the art, there is a need for a multi-tasking screening device that incorporates a configuration of instruments for detecting and measuring a host of biological functions in humans in a single screening tasking process including height, weight, balance, and hearing and vision acuity, and that incorporates a user interface for permitting the input of specific patient information including patient's age, sex and details surrounding patient medical history.

Summary of the Invention

The above problems and others are at least partially solved and the above purposes and others realized in a system that includes force measuring apparatus for measuring weight and balance forces, an abutment attached at a location spaced from and in opposition to the device, apparatus for delivering screening stimulus proximate to the abutment and for calculating height measurements between the abutment and the device, input apparatus for accepting patient responses to the screening stimulus, and a processing unit associated with the force measuring apparatus, the apparatus and the input apparatus for collecting and storing measured weight and balance forces, patient responses from the input apparatus and calculated height measurements between the abutment and the force measuring apparatus. The system is preferably self-contained and well constructed and relatively small and easy to move, and the force measuring apparatus is pivoted to a base of the system so that it can be moved between deployed and stored conditions. The system is furnished with a carriage reciprocated to a support projecting away from the base, which supports the abutment and associates with the apparatus. The screening stimulus includes visual

acuity stimulus, and the apparatus includes a display and the visual acuity stimulus displayed by the display. The apparatus also includes a sensor calibrated with a scale supported along substantially the entire length of the support and that communicates with the processing unit and that, with its association with the scale, calculates the distance between the abutment and force measuring apparatus at any position of the carriage along the support. The screening stimulus also includes audible acuity stimulus and the apparatus speakers or headphones and the audible acuity stimulus is issued by the speakers or headphones. The input apparatus includes a microphone for accepting verbal patient responses to the issued stimulus or a keypad for accepting input patient responses to the issued stimulus and preferably both. The keypad accepts the input of specific patient information including patient's age, sex and details surrounding patient medical history and the input of this information can be delivered verbally and collected by the microphone.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings:

FIG. 1 is a perspective view of a system for collecting patient data, in accordance with the invention, including force measuring apparatus attached to a base, a carriage attached to a support projecting away from the base and having stimulus delivery apparatus and input apparatus for accepting patient responses to screening stimulus delivered by the stimulus delivery apparatus;

FIG. 2 is a side elevation of the system of FIG. 1 as it would appear in use;

FIG. 3 is a rear elevation of the system of FIG. 1;

FIG. 4 is a fragmented perspective view of the system of FIG. 1 showing a cover of the base as it would appear detached therefrom;

FIG. 5 is a fragmented perspective view of the system of FIG. 1 showing the carriage; and

FIG. 6 is a schematic representation of the system of FIG. 1.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Turning now to the drawings, in which like reference characters indicate corresponding elements throughout the several views, attention is first directed to Fig. 1 in which is seen a system for collecting patient data, embodying the principle of the instant invention, generally indicated by the reference character 20 including force measuring apparatus 21 attached to a base 22 each being positionable against the ground or other supporting surface. With additional reference to FIGS. 2 and 3, an elongate support 23 is attached to and projects upwardly and away from base 22 and supports a carriage 24 away from apparatus 21. Carriage 24 is attached to a support 23 for reciprocal movement. In this embodiment, carriage 24 defines a socket 26 (shown only in FIG. 1) through which support 23 extends. Socket 26 captures support 23 and supports bearings, casters, sheaves or wheels that mate with and ride in grooves or channels formed along substantially the entire length of support 23, which structure permits carriage 24 to move smoothly and reciprocally along support 23 and can be reversed. Carriage 24 can be reciprocally attached to support 23 in other ways, which will readily occur to the skilled

artisan.

Looking momentarily to FIG. 6, which is a schematic representation of the various components of system 20, force measuring apparatus 21 measures weight and balance forces and thus includes a scale 30 component and a balance force measuring device 31 component. Carriage 24 supports input apparatus 33 and stimulus delivery apparatus 34, all of which are electronic components that communicate electronically with a central processing unit 35. Processing unit 35 governs the operation of system 20 consistent with a preprogrammed software architecture 36, and is associated with electronic storage 37 for receiving and storing data and information from force measuring apparatus 21, stimulus delivery apparatus 34 and input apparatus 33 and this will be discussed in more detail ***infra***. Force measuring apparatus 21, input apparatus 33, stimulus delivery apparatus 34 and processing unit 35 are coupled together with conventional data transfer and electronic interconnections and wireless communication pathways can be used if desired. Preferably, processing unit 35 is housed within base 22 as shown in FIG. 4. Base 22 includes a housing that incorporates a removable cover 40 for facilitating access to processing unit 35 for

maintenance, upgrading, etc. Processing unit 35 can be housed elsewhere. System 20 is self-contained and powered by a dedicated power source or a discrete power source, such as one or more rechargeable batteries.

Looking back to FIG. 1, force measuring apparatus 21 includes a housing 50 that supports and contains the scale 30 and balance force measuring device 31 components (scale 30 and device 31 components are referenced only in FIG. 6), and defines a load bearing surface 51 for accommodating a patient in a standing position as depicted in FIG. 2. The scale 30 and balance force measuring device 31 components of force measuring apparatus 21 are capable of measuring, respectively, the weight of and balance forces applied by a patient standing upon load bearing surface 51. In this regard, the scale 30 and balance force measuring device 31 components of apparatus 21 interact with load bearing surface 51 and are conventional and conventionally arranged in connection with one another and with load bearing surface 51. The scale 30 component is any conventional electronic scale arrangement for measuring weight and the balance force measuring device 31 component is any conventional force platform arrangement for measuring force components and moments along one or more axes and along one

or more associated orthogonal axes for use in measuring such forces exerted by a patient in varying forms of stance.

With continuing reference to FIG. 1 and further reference to FIG. 5, carriage 24 supports an abutment 60, speakers 61,62, a display 63 and input apparatus 33. Speakers 61,62 can be designed as headphones if desired. Speakers 61,62 and display 63 make up stimulus delivery apparatus 34, the operation of which is governed by processing unit 35. Processing unit 35 can be considered part of stimulus delivery apparatus 34. Abutment 60 and speakers 61,62 extend away from support 23, overlie force measuring apparatus 21 and are situated in a triangular pattern adjacent display 63, which is located toward support 23, with abutment 60 located above and between speakers 61,62. As shown in FIG. 1 and 2, abutment 60 is supported above and in direct opposition to load bearing surface 51 and is associated with a sensor 65 that is calibrated with a scale 65A supported along substantially the entire length of support 23 and that communicates with processing unit 35 and that, with its association with scale 65A, calculates the distance between abutment 60 and load bearing surface 51 at any position of carriage 24

along support 23. Scale 65A includes spaced-apart lines that are etched or otherwise applied to a surface of support 32 and indicate distance from surface 51 of force measuring apparatus 21. Sensor 65 communicates or otherwise interacts with scale 65A. Under direction of processing unit 35, speakers 61,62 issue audible acuity stimulus designed to ascertain the hearing acuity of a patient, and display 63 issues visual acuity stimulus designed to ascertain the visual acuity of a patient. In response to delivery of the audible acuity stimulus and the visual acuity stimulus, input apparatus 33 receives and accepts patient responses thereto, which responses are sent to and received by processing unit 35 and stored in storage 37. The audible acuity stimulus includes tones or other sounds that are issued in various frequencies and decibel levels, and the visual acuity stimulus includes visual displays, cues or charts and preferably the display of a Snellen chart or other similar chart for measuring visual acuity. Display 63 is a liquid crystal display or other desired display form. Display 63 can also be printed matter if desired.

In operation, a patient stands upon load bearing surface 51 of apparatus 21 as in FIG. 2 and directly

beneath abutment 60 and carriage 24 is moved, either by the patient or by another, as necessary so as to present abutment 60 against the top of the patient's head. Carriage 24 is constructed in such a way such that speakers 61 and 62 reside at either side of a patient's head positioned therebetween with abutment 60 positioned against the top of the patient's head. While standing on load bearing surface 51 and with abutment 60 positioned against the top of the patient's head as shown, system 20 is actuated and a screening operation is to take place in which the patient's weight, balance forces, height, visual acuity and hearing acuity are measured and recorded and stored. With regard to weight and balance forces, force measuring apparatus 21 measures the patient's weight and the balance forces exerted by the patient against load bearing surface 51, which weight and balance force measurements are sent to and received by processing unit 35 and stored in storage 37 as data. With abutment 60 positioned against the top of the patient's head and carriage 24 stationary, sensor 65 communicates with processing unit 35 and calculates the distance between abutment 60 and load bearing surface 51 which is the height of the patient, and communicates this height measurement to processing unit 35, which receives it and stores it in

storage 37 as data.

In terms of screening the patient for audible acuity, the screening operation also includes audible acuity stimulus issued by speakers 61,62 in what is considered a hearing test event of the screening operation. In response to the issued audible acuity stimulus, the patient interacts with input apparatus 33 and submits responses to the delivery of the audible acuity stimulus, which responses are intended to be those that affirm his detection of any such tones or sounds or word utterances and the like. Processing system 35 governs the issuance of the audible acuity stimulus in accordance with preprogrammed parameters of software architecture 36, which issuance is responsive to responses input by the patient to the audible acuity stimulus. Preferably, input apparatus is a keyboard or keypad 70 with which the patient can employ for entering his responses. Keypad 70 is supported by an extension of carriage 24 at a location beneath display and toward support 23, and it can be supported elsewhere. Input apparatus 33 can also include a microphone 71 into which a patient can issue spoken responses. All patient responses are entered into and received by input apparatus 33 and communicated to and

received by processing unit 35, which stores the responses into storage 37 as data. In screening the patient for visual acuity, the screening operation also includes visual acuity stimulus issued by display 63 in what is considered a vision testing event. In response to the issued visual acuity stimulus, the patient interacts with input apparatus 33 and submits responses, which responses are intended to be those that affirm his ability to see such letters, visual cues, etc. Patient responses can be input at keypad 70 or into microphone 71 by means of verbal responses. All patient responses to the visual acuity stimulus are entered into and received by input apparatus 33 and communicated to and received by processing unit 35, which stores the responses into storage 37 as data.

The screening operation that system 20 provides, which is carried out when a patient is standing on load bearing surface 51 of force measuring apparatus 21 with abutment 60 positioned against the top of the patient's head, is thus characterized by the taking and storing of the patient's height weight, balance forces, hearing acuity and visual acuity, with the taking and storing of the patient's hearing and visual acuity being patient responses to delivered hearing and visual acuity stimulus, which

responses are stored in connection with the delivered stimulus. All of these data are stored into storage 37 in the form of an electronic document, which can be accessed and reviewed by clinical personnel and this can be done either with keypad 70 or with a computer linked to system 20 and the latter is preferred. The screening operation can be carried out manually or automatically with preprogramming of processing unit 35. Actuation of system 20 for prosecuting a screening operation can occur in response to a patient standing on force measuring apparatus 21 and abutment 60 resting against the top of the patient's head or in response to a command input at keypad 70. The taking of the patient's height, weight, balance forces and hearing and visual acuity can take place in any desired order and even substantially simultaneously if desired.

Preferably, system 20 is a self-contained stand-alone unit having a relatively sleek and minimal design for taking up a small amount of space. Force measuring apparatus 21 is pivoted to base 22 at pivot joint 80 so that it can pivoted away from base 22 against a support surface as shown in FIGS. 1 and 2 for normal operation and toward and against base 22 for storage of system 20 when not in use. Although it is preferred that force measuring

apparatus 21 be configured to measure weight and balance forces, it can be adapted for measuring only one or the other as may be desired. Keypad 70 is capable of accepting the input of specific patient information including patient's age, sex and details surrounding patient medical history and the input of this information can be delivered verbally and collected by microphone 71 if desired. After such patient information is input, it is delivered to processing unit 35 and stored in storage 37 as data.

With momentary attention directed back to FIG. 4, a pulley system 81 is contained by base 22 and is coupled to carriage 24. Pulley system 81 includes positive and negative portions 81A,81B that permit carriage 24 to maintain position along support 23 yet be easily moved reciprocally from one location to another. FIGS. 1, 2 and 3 illustrate a locking lever 82 attached to support 23 that associates with force measuring apparatus 21. Lever 82 is capable of being pivoted/moved into a first position releasing force measuring apparatus 21 to permit it to be pivotally moved and a second position locking force measuring apparatus 21 in place both toward and against base 22 when system 20 is not in use and away from base as in FIGS. 1 and 2 when system 20 is in use and any

conventional locking mechanism can be associated with lever 82 and force measuring apparatus 21 for carrying out this releasing and locking of force measuring apparatus 21.

The present invention is described above with reference to a preferred embodiment. However, those skilled in the art will recognize that changes and modifications may be made in the described embodiments without departing from the nature and scope of the present invention. Various changes and modifications to the embodiment herein chosen for purposes of illustration will readily occur to those skilled in the art. To the extent that such modifications and variations do not depart from the spirit of the invention, they are intended to be included within the scope thereof.

Having fully described the invention in such clear and concise terms as to enable those skilled in the art to understand and practice the same, the invention claimed is: